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THE ECONOMICS OF RETAIL MARKETS FOR NEW AND USED CARS¹

Prepared for the *Handbook on the Economics of Retail and Distribution*

by

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Abstract

In this chapter we describe the institutions and economics of new- and used-car retailing. Our aim is to provide a resource for researchers interested in the automobile market. We focus on three categories of economic concepts relevant to car retailing: dealership location choice, including agglomeration, entry, and exit; determinants of car pricing; and information, which is central to the used-car market but also affects the new-car market. We also provide a primer on the institutions of car retailing and a reference on data sources for researchers interested in empirical work involving cars.

¹ We thank George Iny of the Automobile Protection Association for providing very helpful comments on an earlier draft.

1. INTRODUCTION

A little over 16 million new cars and light trucks were sold in the U.S. in 2014, nearly all through manufacturer-franchised dealerships. Nearly as many used cars also sold through franchised dealerships, and 26 million additional used cars changed hands through independent used-car dealers and private individuals. In total, the value of new and used vehicles transacted in the U.S. in 2014 approached one trillion dollars.²

In this chapter, we describe the institutions and economics of new- and used-car retailing. The aim is to provide a resource for researchers interested in the automobile market.³ We start by describing the institutions of car retailing. We then discuss several economic principles that are most relevant for car retailing. We organize these principles under three headings:

- Store locations. We cover agglomeration, which is an important aspect of car-dealership location choice, and entry and exit decisions.
- Pricing. This includes price dispersion and consumer search as it relates to the industry; the role of seller inventory; bargaining, which is often part of the price-setting process; discrimination based on gender and race; behavioral biases affecting price; and sales and rebate practices.
- Information. This includes a survey of theoretical and empirical work on adverse selection and moral hazard as it relates to the industry, and solutions to

² These statistics come from National Automobile Dealer Association (2014) and National Independent Automobile Dealer Association (2014).

³ Throughout we use the terms “car,” “vehicle,” and “automobile” interchangeably to indicate passenger cars and light trucks (SUVs, pickup trucks), the terms “purchased” and “sold” to indicate not only traditional cash or financed purchases but also lease transactions, and the terms “dealer” and “dealership” interchangeably.

information problems that have arisen in the industry, such as leasing, certified pre-owned programs, and warranties.

At the end the chapter, we provide a reference on data and resources available to social scientists interested in research involving the car market.

The chapter is not a comprehensive review of all economic topics related to cars. First, this chapter is U.S.-centric and, unless otherwise noted, the discussions and results apply to U.S. institutions, though of course many may apply elsewhere and the economic principles should mostly be universal. We also exclude several topics that are more relevant for car manufacturers than retailers such as planned obsolescence and R&D decisions; econometric techniques that have been applied to car markets but that have a methodological focus (e.g., Berry, Levinsohn, and Pakes 1995); auto-repair considerations; and a number of other topics that one might consider for a chapter such as this one.

2. INSTITUTIONS

All new-car dealerships in the U.S. are franchises of automobile manufacturers, and are responsible for all new-car retailing activities to individual consumers. Most new-car franchised dealerships also sell used cars, and this is an important part of their business model, as franchised dealerships sell about the same number of new and used vehicles and new-car buyers often turn to dealerships to take their used-car trade-ins. Our

discussion below focuses on dealerships that sell new cars and both new and used cars, but some of our exposition generalizes to dealerships that sell only used cars.⁴

A franchise agreement spells out numerous sales and service responsibilities of both parties. The contract is for a particular brand at a particular location, but a dealership is permitted to sell multiple brands from multiple manufacturers (i.e., the dealership can sign multiple franchise agreements). Dealerships are permitted to sell cars to any customer at any price.

A Brief History of Dealerships in the U.S.⁵

The existence of dealerships dates to the beginning of the automobile industry in the late 1890s. In the first few decades of the twentieth century, cars were distributed to customers in many ways, including through wholesale distributors, dedicated retail-car dealerships, manufacturer factory stores, department stores, and mail order. In these early days, dealerships had simple contracts with manufacturers, and dealership service and promotional roles were limited.

By the 1950s, the relationship between dealerships and manufacturers had become increasingly complex and remains much the same today. At the same time that franchise contracts became more complex, they also became more standardized. For example, franchise contracts required dealerships to make investments in facilities, service equipment and inventories, and to follow strict rules for warranty service.

Manufacturers also began preferring fewer dealerships with more amenities and greater repair service per dealership. In fact, the number of dealerships in the U.S. peaked in the

⁴ As noted in the Introduction, there is also a large consumer-to-consumer segment of the used-car market. Some of the discussion later in this chapter applies to both new and used cars, including this segment.

⁵ Much of this discussion draws on Marx (1985) and Lafontaine and Scott Morton (2010).

late 1920s at over 50 000, and has trended downward ever since to approximately 34 000 in 1960 and fewer than 20 000 today.

The 1950s also saw an increasing number of disputes between dealers and manufacturers, such as over manufacturer requirements that dealers purchase excess inventory. Dealers also became increasingly worried about termination given the trend toward fewer dealerships. These concerns, coupled with increased lobbying by dealer groups of federal and state legislatures, culminated in an environment of increased federal and state regulation of the dealer-manufacturer relationship that continues today.

New-Car Sales Today⁶

New cars are typically displayed in a lot or showroom of a dealership. U.S. federal law requires that a so-called “Monroney sticker” (originating from the Automobile Information Disclosure Act of 1958) be displayed on the car. This sticker reports an offering price and various car characteristics such as crash-test ratings, warranty details, and, as of the 2013 model year, detailed fuel efficiency and environmental information.

Consumers typically bargain over a final price, the terms of financing or leasing, the value of a trade-in vehicle, and whether they will purchase ancillary products and services such as a supplemental warranty, rust proofing, and payment protection insurance. This bargaining occurs with a sales person whose salary is primarily based on a sales commission of about 20 to 30 percent of the profit margin of the dealership, while ancillary services and the financing and leasing terms applicable to the sale is sometimes

⁶ Some information in this section is from conversations with dealership owners.

handled by a specialist called a business manager. On average, final sales prices are significantly lower than the offer prices listed by the dealership, which is usually the manufacturer's suggested retail price (MSRP),⁷ though these sales are sometimes accompanied by high-margin sales of ancillary products and services mentioned above. We discuss the various economic aspects of car pricing and the negotiations process in more detail in Section 4.

Dealerships purchase their inventory from the manufacturer, such that inventory on the dealership lot is no longer property of the manufacturer. However, many manufacturers provide financing to dealerships to purchase inventory, often through a financial subsidiary of the parent company of the manufacturer. The terms of financing often depend on the success of the dealership, either in terms of sales volume or quickness of sales. For example, the interest rate on a particular car in inventory might rise each month it is not sold.⁸ The fact that dealers and manufacturers use what is essentially a linear price schedule, and that dealers own the inventory, may create incentive problems between dealers and manufacturers. For example, linear wholesale prices in vertical relationships typically lead to a "double marginalization" pricing externality, where retail prices are too high (and sales are too low) from the perspective of the joint dealer-manufacturer surplus. There are alternative vertical arrangements that might help to relieve such incentive problems. For example, Brenkers and Verboven (2006) studied exclusive contracts and territories in European car markets, and Mortimer

⁷ For example, truecar.com reports the mean transaction price for a Honda Accord in Virginia in early 2015 was \$1,300 below MSRP.

⁸ Days to turn (the number of days a car is in inventory) in 2014 averaged 20 to 70 days, depending on the manufacturer. See Edmunds (2015).

(2007) studied revenue-sharing agreements in the video rental industry.⁹ One revenue-sharing arrangement that has generally not been adopted in the car industry but that has the potential to reduce the double-marginalization problem involves a lower marginal wholesale price for the car but a revenue-sharing component. This type of arrangement is predicted to induce more efficient behavior by incentivizing higher volumes.

In addition to the offer price of the car, consumers typically also pay several smaller fees, including a delivery charge (a flat fee per car), which legally must be listed by the manufacturer and is not included in the MSRP. Additionally, most manufacturers give dealerships a cash payment, known as a “holdback,” for each car sold, which is usually between one and three percent of the invoice price. This holdback is not disclosed on the sales sticker on the car. It is common for consumers to finance car purchases using a financial company arranged through the dealer and dealers often mark up the interest rates offered through partner financial institutions.¹⁰

Manufacturers often run promotions directed at consumers or dealerships or both. These promotions usually take the form of rebates that are technically redeemed post-sale. Rebates directed at dealerships are often not reported to consumers.¹¹ There are now many websites that report information about car features and pricing including rebates, and some have begun publish individual transaction prices from auto industry data

⁹ For a more comprehensive review of vertical arrangements, such as other forms of non-linear pricing and quantity forcing, see Tirole (1988), Chapter 4. There is a large theoretical literature that seeks to understand contractual forms that induce efficient supply of products to the market from the perspective of total producer surplus. A comprehensive review of vertical contracts in the retail sector is provided by Smith in Chapter 5 in this volume.

¹⁰ For a more historical perspective, see Marx (1985).

¹¹ See Busse, Silva-Risso, and Zettelmeyer (2006).

services, further increasing consumer information.¹² With the increase in informational resources for consumers, there is a perception in the industry that consumers have become better informed about the pricing and features of cars. For example, Zettelmeyer, Scott Morton, and Silva-Risso (2006a) found that Internet shopping is associated with lower transaction prices, and that the mechanism for this effect is through consumer learning about the invoice prices of dealers (the invoice price is not advertised on the sales sticker, but consumer websites disseminate this knowledge). There is some evidence, however, that some dealerships are compensating for the increase in consumer information and lower prices by including more hidden or coercive fees. For example, in a recent Industry Canada Office of Consumer Affairs-sponsored field study, the Automobile Protection Association found significant “documentation fees,” fees for environmental protection packages and window-etching theft protection, and other unsolicited add-ons.¹³

Business Lines¹⁴

New-car dealerships in the U.S. are complex businesses. Dealerships are typically composed of several business units: new-car sales, used-car sales, parts, and repair service. Some dealerships also have an in-house finance company. In 2013, new-car sales represented 57 percent of total dealership revenues according the National Automobile Dealership Association. The average new car sold for approximately \$31 000, with a

¹² For example, www.truecar.com, www.edmunds.com, www.kellybluebook.com, www.cars.com, and www.intellichoice.com.

¹³ Ellison addresses price search and obfuscation in several retail sectors, including automobile retailing, in Chapter 13 of this volume.

¹⁴ National Automobile Dealer Association (2014) was a helpful resource for this section.

gross profit of \$1 200. Used-car sales represented 31 percent of revenues and the average used car sold for approximately \$18 000, with a gross profit of \$2,400.

Sales from the parts and repair service departments represented 11 percent of total revenue in 2013. In 2013, dealerships conducted \$14.4 billion of warrantied repair service, paid completely by manufacturers on behalf of consumers. Aside from warrantied service, most dealerships conduct non-warrantied repair service as well, including the 36 percent of new-car dealers that operated their own body shops in 2013. Independent repair service work accounted for nearly \$30 billion in sales in 2013.

The Political Economy of New-Car Dealerships¹⁵

As mentioned above, the dealership-manufacturer relationship became increasingly complex between the 1920s and 1950s. The change in car retailing has been attributed to the change in consumer tastes and production technologies. Prior to the 1920s, many first-time customers were adopting cars as their primary mode of transportation and cars were technically simple, relatively undifferentiated machines, and manufacturers competed against one-another by investing in production technologies that could produce more cars more cheaply. By around 1930, production technologies began to standardize, and the typical customer was a previous car owner who demanded a higher quality product suited to his or her particular needs. A brand's success became more dependent on aggressive sales tactics, adequate inventory, and post-sales service.

By the 1950s, car manufacturers had become an oligopoly with General Motors (GM) claiming nearly 50 percent of the U.S. market, and wielding enormous influence on

¹⁵ The history of car-dealer franchise regulations is documented in Marx (1985) and Lafontaine and Scott Morton (2010). See also Fulda (1956), McHugh (1956), Canis and Platzner (2009), and Bodisch (2009).

the industry. At this time, manufacturers were actively dissolving dealerships, and there was a constant threat to dealerships that if they did not satisfactorily cater to customers (showroom, inventory, maintenance) then the manufacturer would terminate the franchise relationship. In response, the federal law called The Automobile Dealer Franchise Act of 1956, more widely known as the *Dealer's Day in Court Bill*, was signed into law. The bill requires manufacturers to prove “good cause” in order to terminate a dealer franchise relationship, giving legal protection for dealers.

Since that time, state dealer-franchise regulations have become relatively standardized across all 50 states and states have strengthened the *Dealer's Day in Court Bill* so that manufacturers are essentially prohibited from closing dealers. In practice, if a manufacturer wants to close a dealer it must offer the dealer a buyout; if the dealer does not freely accept the offer, the outcome is decided by arbitration. For example, General Motors spent more than \$1 billion on dealer buyouts when it closed its Oldsmobile line.¹⁶

Regulations also specify that dealers must be independent of manufacturers and manufacturers cannot sell cars directly to consumers.¹⁷ Franchise contracts are not permitted to include franchise fees, require a specific level of service, advertising, or inventory, or charge anything other than linear prices for cars.¹⁸ Also, manufacturers in principle are required to treat all dealers in the same state equally with regards to the

¹⁶ See Surowiecki (2006). The settlement payment rules, however, are sometimes vague. For example, in Washington state, the manufacturer must “pay to the new motor vehicle dealer the fair market value of the motor vehicle dealer's goodwill for the make or line,” where the meaning of goodwill is not defined.

¹⁷ Manufacturers, however, occasionally have showrooms without a direct selling operation or own a facility that they lease out to a dealer. The electric-car manufacturer Tesla is a notable example for manufacturer with standalone showrooms, which then sells cars through Internet or phone orders.

¹⁸ However, there is usually a provision that the dealership must maintain some vague notion of an acceptable level of service or inventory.

wholesale car prices and provision. Manufacturers are also forbidden from franchising a new dealer within a certain distance of a current dealer of the same brand, with the distance depending on the state and the population density of the local market (see Mathewson and Winter 1989 for a discussion and analysis of this issue). In practice, manufacturers have sometimes circumvented the spirit of these regulations, e.g., by basing the financing terms they provide to dealers for their inventory on dealer performance, as mentioned earlier.

Non-U.S. Car Dealerships

The European car market has a comparably complex structure as the U.S market, but differs in some details. In 2003, there was a major revision to dealership regulations in the European Union. These regulations aimed to promote more competition in new-car selling by allowing dealers to sell multiple brands, loosening restrictions on cross-border sales, and permitting consumers to obtain service cars at repair shops not affiliated with the selling dealer, including independent repair shops.¹⁹

Employing new-car sales data from Europe, Brenkers and Verboven (2006) found that the former European regulatory environment for new-car sales severely harmed consumers, and that greater inter-brand and cross-border competition would exist under the new regime. Nurski and Verboven (2013) examined how exclusive dealing has acted as a barrier to entry in this market.²⁰ They found that, although there are not individual incentives for manufacturers to install exclusive-dealing contracts, there is a collective

¹⁹ See European Commission (2003) and Nurski and Verboven (2013) for an overview of these regulations.

²⁰ Exclusive dealing is when a dealer contractually agrees to sell only a single manufacturer's brand. It is usually coupled with the manufacturer agreeing not to sell through any other dealers within the original dealer's geographic territory (an "exclusive territory").

incentive for an exclusive-dealing regime. However, exclusive dealing hurts smaller manufacturers that have smaller dealer networks. It also may alter dealer power with respect to manufacturers, as a multi-brand store could shift its emphasis to the brand that has more appealing products or offers better terms.

3. DEALERSHIP LOCATION, ENTRY, AND EXIT

As mentioned, Lafontaine and Scott Morton (2010) documented the steady decline in the number of new-car dealerships in the U.S. since their peak in 1927 at 53,125 such that, by 2010, there were 18,607. Because Japanese auto makers did not start entering the U.S. market until the 1950s, and their cars did not sell well until 20 years later, the reported decline in dealerships is entirely due to U.S. brands.²¹ In fact, most foreign brands, including Honda and Toyota, have been expanding their dealer networks in the U.S., even recently.

Murry and Zhou (2014) and Murry (2015) documented the market structure of dealerships at a more disaggregate level using Virginia Department of Motor Vehicles data. In addition to confirming the imbalanced growth of U.S. versus foreign-branded dealerships indicated in Lafontaine and Scott Morton (2010), they documented that there are many more U.S.-brand dealerships than foreign-brand dealerships in metropolitan areas (in part a legacy of U.S. residential organization prior to suburbanization), and that U.S.-brand dealerships have many rural locations, whereas foreign brands have virtually no rural locations. Foreign dealerships entered the U.S. market much later than U.S.

²¹ Part of the reason for the late entry of Japanese manufacturers was large U.S. import barriers on automobiles. For an economic analysis, see Berry, Levinsohn, and Pakes (1999).

brands and because of this faced different consumer preferences, dealer franchise regulations, and production and distribution technologies when making entry decisions.

Murry (2015) predicted the welfare outcome if Ford, a large dealer network, were to shrink and geographically organize its dealer network to be like Toyota's, which is about half the size of Ford's. He predicted that, after dealer closures, Ford would substantially decrease local-market brand advertising, with the result that the remaining Ford dealers would be worse off because they receive less advertising from the brand, even though they face fewer same-brand competitors. He found this result by estimating a structural model of demand and supply for new cars, where consumers derive utility from both proximity to the car dealership and the amounts of both retail and manufacturer advertising. When a manufacturer has more dealers in a city, it has a relatively higher marginal benefit of advertising than the dealers. If the dealers of the same brand do not compete too closely (measured partly by the consumer disutility from distance), then they prefer more dealers because the manufacturer will bear the cost of advertising instead of any one dealer and the benefit of more advertising will outweigh the cost of increased competition. This is in contrast to the predictions of a model without advertising, or any other service provision that is substitutable between dealers and manufacturers, where the manufacturer would want as many dealers as possible so that retail competition drives prices to marginal cost.²²

In 2008 and 2009, GM and Chrysler proposed closing approximately 3 000 dealerships in total, viewing their bankruptcies as a way to bypass dealer-franchise laws

²² The theoretical results of the effect of service provision in vertical arrangements dates back to much earlier work, for example see Mathewson and Winter (1984).

that would otherwise restrict such closures. In the end, many fewer dealers were actually closed: Many dealers challenged the closings in court and were able to reclaim their franchise agreements, and GM reversed many of its closure decisions. Although it is difficult to attribute an exact number of dealer closures during the great recession to franchise terminations rather than to more general economic conditions, probably fewer than 1000 GM and Chrysler dealerships were terminated around this time. Moreover, these terminations included GM's Saturn dealerships, which all closed because of the termination of the brand.²³ The effect on consumer welfare of the recent closures is an open question, and understanding more specifically the optimal size and location of selling networks in this industry is a potentially interesting area for future research.

Along with the exit of dealers because of financial problems, there has also been significant consolidation in the car-retailing industry since the 1980s. There are now three Fortune-500 companies whose primary business is dealership operation: AutoNation (228 stores and 269 franchises), Sonic Automotive (102 stores and 123 franchises), and Asbury Automotive (80 stores and 100 franchises).²⁴ The largest of the three, AutoNation, had \$19.1 billion in sales in 2014. These conglomerates buy out other dealers by offering the management long-term employment contracts in exchange for the rights to their franchise contracts and current inventory. In some cases, dealership

²³ See New York Times (2009) for the list of Chrysler dealers [accessed February, 6, 2015]. While Saturn dealerships typically were standalone entities, GM's Pontiac brand was also terminated, but these franchises were sometimes dualled with GM's Buick brand and hence the franchise operation may have continued. Interestingly, Ford appears to have been supportive of sustaining a healthy GM and Chrysler during the great recession, as the benefits of economies of scale in the upstream parts markets shared across the firms may have outweighed the costs of competition in the primary market. See Fazel-Zarandi, Horstmann, and Mathewson (2015) for an analysis of this trade off.

²⁴ Store and franchise data are from the 2013 annual reports of AutoNation, Sonic Automotive, and Asbury Automotive. The term "store" refers specifically to a physical location with potentially multiple brands of cars (under potentially different franchise agreements).

locations are consolidated into a single large auto mall where many different brands are sold. These are publicly traded companies, a characteristic that aids in the large capital requirements involved in car selling (e.g., inventory), and their large size affords some scale economies such as in advertising.²⁵ Empirical work is needed to understand the tradeoff between reduced costs and increased market power due to consolidation in this industry, both from a consumer welfare point view and also from the perspective of manufacturer surplus.

The scale and scope of changes in the market structure of new-car dealerships over recent decades (including exit by U.S. brands, entrance by foreign brands, and consolidation) have likely affected consumer and firm welfare. Murry and Zhou (2014) examined an important aspect of these changes, the effects of dealership-location decisions. Specifically, they documented pervasive co-location of dealerships in the Richmond, Virginia market (identifying nine dealership clusters) and its effects on welfare. The median distance from one dealership to another in their data is less than a mile. By estimating a differentiated-products demand model that allows dealership co-location to affect utility, they found that consumers prefer to purchase a car from a dealership if there are more dealerships close by, conditional on local population, distance from the consumer, prices, and other factors. This suggests that consumers search at the dealership-cluster level, and implies higher demand for dealerships in larger clusters.

²⁵ Franchise agreements require manufacturer consent to move the location of a dealership. In the Sonic Automotive annual report, the company mentioned that it has a policy of negotiating dealership-location consolidation with manufacturers.

Albuquerque and Bronnenberg (2012) and Murry (2015) found that distance from the consumer to the dealership is an important determinant of demand for cars by estimating differentiated-products demand models using micro level choice data where consumers directly derive utility from the distance between their home and the dealership. Given this finding, the current trend of rural closures may have significant welfare implications for rural consumers who are facing increasingly longer travel distances to search for cars. Scott Morton, Zettelmeyer, and Silva-Risso (2011) and Moraga-Gonzalez, Sandor, and Wildenbeest (2012), documented high search costs associated with purchasing new cars, and, in the case of Scott Morton, Zettelmeyer, and Silva-Risso (2011), high returns to consumers of increased information through the Internet. Understanding the degree to which the cost of dealer closures on consumer welfare is offset by the increase in information from the Internet would be an interesting area for future research.

There is a burgeoning economics and marketing literature on the entry and location decisions of retail firms (see chapter 9 by Aguirregabiria and Suzuki on retail entry in this volume). This literature builds on existing methods of analyzing firm entry decisions to incorporate features that are unique to retail markets (e.g., Jia 2008 and Grieco 2014). However there has been limited application of these methods to car dealerships. In their seminal work on entry games, Bresnahan and Reiss (1990) applied their method for estimating entry games to new-car dealerships in isolated markets. They conclude that market size is the primary determinant of the number of firms in a local market, and that monopolist dealerships do not create barriers to entry to deter entry and

preserve profits. There are unique features of this industry that could be explored using the current tools of structural empirical entry games. For example, it would be interesting to explore how regulations in this industry have contributed to the important differences between U.S.- and non-U.S.-brand manufacturers in the geographical organization of dealer networks.

4. PRICING

Retail pricing in the new- and used-car markets has received significant attention in the economics and marketing literatures. In this section, we review the following topics that are direct inputs into pricing, which have received attention for the car market: inventory, bargaining, race and gender discrimination, consumer behavioral biases, and price discounts. The car market is also unusual for being a large retail market where consumers pay what are essentially personalized prices. We provide some discussion of this as well.

Cars are highly differentiated and consumers must choose from a multitude of pre- and post-market options. This naturally leads to large price differences across car models and options. As an example, the website truecar.com reports that transaction prices in the Albany, New York area for a new 2015 Honda Accord Sedan with the LX CVT trim, 4-cylinders, automatic transmission, in silver with a black-cloth interior ranged from approximately \$20,500 to \$24,750 as of February 7, 2015 (the mean price was \$22,555). Figure 1 shows this distribution, which is representative of other new-car model-trims and geographic regions. The durable nature of cars and an active secondary

market are other complex dimensions along which cars are differentiated. Because of this differentiation and the resulting need for many consumers to view the product in person, the car-shopping process involves costly search. Spatial price dispersion is a hallmark of costly search. Dealer inventory optimization, production lags, and temporal demand cycles also characterize car retailing, all of which may generate temporal price dispersion. In summary, a range of factors seemingly contributes to the tendency away from uniform pricing even conditional on observable car characteristics.²⁶

These features on their face, however, do not explain why personalized prices occur in the automobile industry but not in many other markets for high-priced consumer goods, such as televisions, computers, and furniture, which share many of the features above. But there are many features of car retailing that set it apart.

One distinguishing feature may simply be the heightened importance of these features in the car market. For example, cars are more differentiated than many high-price consumer goods (closer to jewelry and homes than to televisions and computers). Another factor is that new-car purchases often involve trading in the consumer's used car, which has a unique value and may be worth different amounts to the two parties. Using a posted price in such a transaction is less straightforward.

Consumers may also vary more in their willingness to pay for cars than for other goods, not only because the high price plays an outsized role in the household budget, but also because the importance of owning a car (and particular type of car) varies tremendously across households depending on public transportation options, preferences

²⁶ Studies on search that are specific to the automobile market include Ratchford and Srinivasan (1993) and Moraga-Gonzalez, Sandor, and Wildenbeest (2012).

over conspicuous consumption, need for car reliability, and so on. Because of the high prices of cars and this variation in willingness to pay, Zettelmeyer, Scott Morton, and Silva-Risso (2006b) suggested that dealers have extra incentive to engage in costly learning about consumer willingness to pay, including bargaining, instead of simply posting a price.

Manufacturer and dealer inventory and production decisions also play an outsized role in the car market and may contribute to the bargaining process. Inventory costs are larger in the car market than in markets for most other consumer goods due to the high price of the good, the costly and time-consuming assembly and transportation of the product, and the need to have product variety in stock for searching consumers. Moreover, demand uncertainty and inventory fluctuations can cause different shadow costs of keeping a car on the lot at different times. There is also large variation in information across market participants in the car market, and, in particular, the used segment of the market.²⁷

Finally, it is worth noting that car dealing has its roots in horse trading, a market for which each product (the horse) was unique and there was a culture of haggling. To an extent, this institution survived the shift in transportation mode from horse to automobile in the early 20th century.²⁸

All of these factors together may explain why price dispersion and bargaining are central features of car retailing. This is despite efforts of some dealer chains and brands to move to posted prices over the years – for example, the Saturn brand used posted, no-

²⁷ Inventory and assortment are discussed in a different context by Hickman and Mortimer in Chapter 14.

²⁸ See, for example, Gelber (2008).

haggle prices for at least its first ten years on the market, before going out of business.

We expand on several of these issues below, with an examination of asymmetric information in the Information section later in this chapter.

Inventory

Car manufacturers typically produce a new version of a car model each year, partially making obsolete the current model-year inventory. Due to the high prices of cars and the need for dealers to have a variety of new- and used-car models and trims on the lot, the value of inventory is also very large, imposing a weighty and depreciating physical stock on dealerships. Additionally, fluctuating inventories (for production or demand reasons) can create scarcity rents at dealerships and lead to price dispersion for particular models across time. These factors create a complex dynamic pricing problem in which dealerships must balance their current profit margins against the cost of the stock depreciation and the expected amount of inventory carrying over into the next model year.

Copeland, Dunn, and Hall (2011) examined this inventory-management problem and presented four empirical regularities: (i) new-car prices decline by nine percent on average from the start to the end of the model year; (ii) two model years of the same new car model are typically simultaneously available for six months; (iii) sales and inventories are hump-shaped in the first-year of a vintage; and (iv) dealerships carry inventories equal to 75 days of sales on average. The authors estimated a differentiated-products demand model accounting for the effect of variety of inventory on utility, and found a high consumer taste for inventory. The authors then simulated a build-to-order

counterfactual – this naturally represents the highest possible variety – and found that prices would decline much more slowly in this counterfactual case, aiding the dealership in its inventory problem. Olivares and Cachon (2009) also provided evidence of consumer taste for variety, showing that GM dealers hold more inventory when facing more competition.

Zettelmeyer, Scott Morton, and Silva-Risso (2006b) examined how scarcity contributes to price dispersion in the car market. Using data on new-car transactions and dealer inventory levels, they found that not posting a price allows dealerships to evaluate, on a daily basis, the opportunity cost of not selling a car and adjust the price accordingly. Because some cars are in short supply, this scarcity allows dealers to target the highest willingness-to-pay consumers in some cases.

Discounts

Frequent price discounts are a staple of the retail environment for new cars and they typically appear as a consumer rebate, a dealer rebate, or a lower interest rate (or lower implied interest rate in the case of leasing). Other marketing practices associated with discounting have involved “employee discount” sales where consumers allegedly pay an “employee” price, and government programs aimed at boosting new-car sales.

Price discounts are frequently framed in terms of rebates in part because the manufacturer is providing the rebate amount distinct from the dealership offer (though of course the dealership may adjust its offer to account for the rebate); and, we speculate, in part because rebates are reported in dollar amounts rather than percentage-discount terms, which may be perceived as tricking the consumer into believing the discount is larger

than it really is: In a sample of transactions from California in 1998-2000, Busse, Silva-Risso, and Zettelmeyer (2006) found that 26 percent of transactions involved a consumer rebate – the average consumer rebate was \$1,200, which might seem large to consumers in absolute terms, but only represented five percent of the price, a smaller discount percentage-wise than is typically found in retail markets for other goods.

Busse, Silva-Risso, and Zettelmeyer (2006) also tested the hypothesis that a rebate of equal size to the consumer or to the dealer generates the same end price for the consumer. A simple model where manufacturers post linear take-it-or-leave-it wholesale prices (and choose some rebate) and, in turn, dealers post take-it-or-leave-it retail prices to consumers implies that the incidence of the rebate (a subsidy) is the same for the two types of rebates. However, the authors find that consumer rebates lead to lower consumer prices than dealer rebates, and suggest that the bargaining process may explain this discrepancy, as consumers are less informed about dealer rebates. They use both a difference-in-differences and a regression-discontinuity approach with transaction-level new-car sales data. In the difference-in-differences approach, the authors infer the treatment effect of a rebate on prices by comparing the final transaction prices of rebated cars to similar cars that are not rebated at the same time. For the regression discontinuity design, the authors use variation in prices one week before and after the start of the rebate, arguing that underlying demand for a particular car takes more time to evolve than a couple of weeks.

As mentioned, another promotion tactic is for manufacturers and dealers to offer “no-haggle” pricing based on an alleged price that a company employee would receive.

Given that dealers and consumers usually negotiate a price, it is not clear why a single price would make dealerships better off unless the no-haggle price is sufficiently high to compensate the dealer for the loss of price discrimination through bargaining. In fact, Busse, Simester, and Zettelmeyer (2010) studied one such promotion by U.S. car companies in 2006 and found that transaction prices actually increased during the promotion. They conclude that the “employee discount” promotion changed consumer expectations about future prices, such that consumers who would have normally waited for a discount moved up their purchase to the current period. The authors argued that consumers with limited information on transaction prices of cars rely on signals from the manufacturer about prices.

Some countries have enacted government-supported scrappage programs for used cars. Scrappage programs incentivize the replacement of old cars with new cars, and have the dual goal of stimulating car sales and improving fuel efficiency by removing high-emissions cars from circulation. In the U.S., this program was called “Cash for Clunkers” and lasted for approximately two months in the summer of 2009. It provided up to a \$4,500 subsidy for purchasing a fuel-efficient car with a fuel-inefficient trade-in. Using car-registration data from Texas, Hoekstra, Puller, and West (2014) found that the increase in sales over those two months was completely offset by a reduction in sales in subsequent months, such that the program merely shifted car purchases over a several-month time window. Additionally, the incentives for fuel-efficient cars induced consumers to primarily purchase low-cost cars, which substantially reduced industry revenue during the period of the program. Nevertheless, they found an increase in fleet

fuel economy. See also Schiraldi (2011), Mian and Sufi (2012), and Li, Linn, and Spiller (2012), which generally found similar and additional results.

Discrimination

One consequence of bargaining and personalized pricing is that dealerships have an avenue for price discrimination. Several studies documented price discrimination in this industry. Ayres and Siegelman (1995) used a field experiment where they instructed fake car buyers to negotiate the purchase of a new car. They found that white females, black females, and black males received initial price offers of \$250, \$450, and \$1,100 higher than white males. These differences may be due to statistical discrimination over reservation prices and negotiating techniques, or taste-based discrimination where sellers have personal preferences concerning their trading partner.

Goldberg (1996) used data from the Consumer Expenditure Survey to document that actual transaction prices do not exhibit the type of discrimination found in Ayres and Siegelman (1995). The only overlapping finding is discrimination towards black men, although at a level of \$274 rather than \$1,100. Consistent with Goldberg (1996), Scott Morton, Zettelmeyer, and Silvo-Risso (2003) found that Hispanic and black consumers paid less than one percent more than white consumers after controlling for other characteristics such as income and education. They also found no discrimination for consumers who initiated their purchase over the Internet.

Harless and Hoffer (2002) examined dealer margins from new-car transaction data, and found no differences in margins by gender but did find differences by age, such that older consumers generated larger margins. Expanding on these results, Chandra,

Gulati, and Sallee (2015) found that dealer margins were highest for older women, then older men, then younger men, and the lowest margins were for younger women. Finally, Kwon et al. (2015) found that dealers evaluate buyer trade-in decisions as a means to price discriminate – specifically, a buyer’s decision to trade in a car, which is less time consuming but returns a lower price compared to selling it privately, indicates that the buyer is less price sensitive; and the type of car that the buyer trades in provides a clue about the buyer’s tastes and willingness to pay.

Bargaining

A salient feature of the car market is price dispersion that seems to arise from the bargaining process. Scott Morton, Zettelmeyer, and Silva-Risso (2011) used matched data on car transactions and a survey of new-car buyers to document significant price dispersion for observably very similar cars. They found that consumers with more information and lower costs of searching received lower prices; for example, consumers who know the dealership invoice price pay \$140 less, and consumers who visit more than four dealers pay one to three percent less than consumers with fewer visits. This evidence indicates that the significant price dispersion is due in part to the bargaining process and is not simply the result of heterogeneous dealership costs, inventory issues, or other factors.²⁹

Additional factors

There is evidence that consumers exhibit inattention problems during the car-shopping process despite the large sums of money and substantial research that are

²⁹ See Desai and Purohit (2003) for a theoretical treatment of a car-like market with bargaining.

involved. Lacetera, Pope, and Sydnor (2012) documented discontinuous drops in used-car prices at certain odometer readings; consumers pay substantially less for cars with slightly more than 10 000 miles, 100 000 miles, and so on. This behavior also affects the supply of used cars such that sellers are disproportionately likely to sell their cars just before these mileage thresholds.

Alcott (2013) examined another potential behavioral bias, that consumers' beliefs about the value of a fuel-efficient car are systematically biased and that consumers misperceive the difference in fuel costs between cars with different miles per gallon ratings. Using survey data, he found that consumers correctly value fuel economy for relatively similar cars, but, confirming previous finds such as Larrick and Soll (2008), found that consumers are subject to "MPG Illusion." That is, consumers perceive a linear relationship between *miles per gallon* and fuel efficiency, when in fact the relationship is linear for *gallons per mile*. Using a structural demand system, the author estimates that the average miles per gallon for vehicles sold would rise by less than one if consumers correctly valued fuel efficiency. The implication is that the consumer welfare benefit of higher government miles-per-gallon requirements, in terms of consumer fuel expenditure savings, may not be that large.

Also, given that dealer-franchise regulation requires dealers and manufactures to be independent, a double-marginalization may exist in this market. Albuquerque and Bronnenberg (2012) and Murry (2015) both found evidence of this, predicting that double marginalization substantially distorts consumer welfare in this market. Tesla is noteworthy as being the only significant firm in the U.S. that operates both

manufacturing and dealer operations, which in principle proffers a pricing advantage over rivals by avoiding double marginalization.

As mentioned above, buyer and seller information about car quality is likely to play a central role in the used segment of the car market. We leave this discussion to the Information section just below, where we discuss information issues more broadly.

5. INFORMATION

Since the seminal work of Akerlof (1970), the car market has been associated with adverse selection. Akerlof (1970) considered a market in which one group of individuals owns used cars at the beginning of the game, where these cars vary in quality and each owner knows the quality of his or her own used car. Another group does not own any cars at the beginning of the game but values used cars more than the individuals who own the cars, so it is efficient for all the used cars to be traded on the secondhand market. But if the potential buyers on the secondhand market cannot observe the qualities of specific cars offered for sale, then there is a single secondhand price that reflects the average quality of the cars offered for sale. This deters owners of high-quality cars from selling their cars, which lowers buyer expectations over the quality of cars on the market, which deters the next lower tier of owners from selling their cars, and so on. The result is that the market unravels and no trade occurs.

For obvious reasons, research on adverse selection has focused on the used rather than the new segment of the market, but adverse selection may affect the new market as well. This can occur because adverse selection causes cars on the secondhand market to

be worse substitutes for new cars due to the lower secondhand quality, affecting the level of demand for new cars. This can also occur because car owners under adverse selection tend to keep their cars for longer, thereby trading up to new cars less often and reducing new-car demand.³⁰ Moral hazard may also affect the car market, which we also discuss below.

A range of solutions has developed in the car market to address the adverse-selection and moral-hazard problems, and many have become institutional features of car retailing. We first summarize the literature on information problems as it relates to the car market and then discuss solutions.

Adverse Selection and Moral Hazard

Theoretical work on adverse selection in durable-goods markets since Akerlof (1970) has added realism to the stylized analysis of Akerlof and examined mechanisms to mitigate the predicted market failure. This theoretical work includes Wilson (1980), Kim (1985), Hendel and Lizzeri (1999), Kessler (2001), Levin (2001), Hendel, Lizzeri, and Siniscalchi (2005), and Belleflamme and Peitz (2014).³¹

Starting with Bond (1982, 1984) and Pratt and Hoffer (1984), empirical researchers have examined these predictions with, until recently, mixed results. Specifically, Bond (1982) found no difference in repair rates between traded and non-traded younger trucks, whereas Pratt and Hoffer (1984) and Bond (1984) found more repairs of older traded trucks. Lacko (1986) found more repairs of used cars purchased

³⁰ For other aspects of the interaction of the new- and used-car markets, see, e.g., Waldman (2003), Esteban and Shum (2007), and Chen, Esteban, and Shum (2013).

³¹ Related work notes that market participants may have different “personality” types – specifically, some individuals may be honest, truthfully revealing even low car quality. See Rauh and Seccia (2014) for a discussion on how this may affect adverse selection in the car market.

through newspaper ads than of cars purchased from friends and relatives, where the former presumably have more asymmetric information. Adams, Hosken, and Newberry (2011) found no evidence of adverse selection in the market for younger used cars based on price-depreciation patterns. Emons and Sheldon (2009) and Engers, Hartmann, and Stern (2009) found evidence of adverse selection from turnover patterns, whereas Porter and Sattler (1999) did not. Lewis (2011) examined car retailing on eBay and found that information disclosures could limit adverse selection online.

Building on the model in Hendel and Lizzeri (1999), recent work by Peterson and Schneider (2014a) considered a car as an assemblage of parts, with some parts being characterized by symmetric information and others by asymmetric information. This distinction is important because the deterioration of *observed* parts should *increase* trade volume, whereas the deterioration of *unobserved* parts should *decrease* trade volume. The former is due to the gains from trade between buyers and sellers with different valuations for car quality (i.e., “sorting”), while the latter is due to adverse selection. Because of the opposing nature of these effects, they may mask each other in empirical analysis that considers the good as a whole. Disaggregating car parts according to their information properties can aid in estimation, and Peterson and Schneider (2014a) found that secondhand trade is indeed decreasing in the defect rate of unobserved parts and increasing in observed parts, which is exactly as expected under adverse selection.³²

Moreover, Peterson and Schneider (2014b) showed how the interaction of adverse selection and sorting can actually cause worse adverse selection among high observed-

³² In related literature, Genesove (1993) also examined the used-car market and found weak evidence that buyers could infer unobserved quality from observed seller characteristics.

quality used cars. Building on the logic above, when a used car has deteriorated such that it has low *observed* quality, there is often a gain from trade from sorting. However, when a used good has retained a high observed quality, this sorting motive is absent, and there must be another reason for the seller to sell the car. One immediately thinks of hidden defects. Peterson and Schneider (2014b) provided empirical evidence that supports this prediction.

Some empirical work has tested for adverse selection across different segments of the secondhand market. As mentioned, Lacko (1986) found more adverse selection among anonymous transactions compared to those through family and friends. The results in Peterson and Schneider (2014a) suggest more adverse selection in trades between private individuals compared to dealers. The former is likely due to family members and friends disclosing more information, while the latter may result from the reputational concerns of dealers to win word-of-mouth and repeat business.

Finally, as mentioned, Hendel and Lizzeri (1999) and others have noted how reduced demand in the secondhand market from adverse selection may reduce trade in the new-car market. This is because fewer used-car owners are trading up to new cars due to the depressed prices they would receive for their cars in the secondhand market. Peterson and Schneider (2014a) investigated this empirically, showing that, for the least reliable makes such as Dodge, up to 16 percent of used-car owners delay trading up to a new cars due to adverse selection.

The secondhand car market may also have a moral-hazard problem in the form of reduced incentives for car care among owners who anticipate selling their car. This would

occur if the cost of conducting maintenance is not fully reflected in the secondhand price. Peterson and Schneider (2014a) and Johnson, Schneider, and Waldman (2014) tested whether individuals who anticipate disposing of their car indeed conduct less maintenance. Perhaps surprisingly, Peterson and Schneider (2014a) found no reduction among owned cars in oil changes and other routine maintenance in the year prior to trade. On the other hand, Johnson, Schneider, and Waldman (2014) found much less maintenance for leased cars in the year prior to lease expiration.³³ The reason for the discrepancy between owned and leased cars may be that maintenance is verifiable to used-car buyers but not contractible with lessors, which would incentivize car owners, but not lessees, to conduct maintenance.

We now turn to the range of solutions for addressing these information problems. Some have proven more effective than others, but all have reached widespread adoption.

Vehicle History Reports

Since CARFAX vehicle history reports (VHRs) became available to the non-commercial public in the U.S. in 1996, the use of VHRs has become integral to the used-car-buying process. Private companies aggregate data from third parties, such as insurance companies, police reports, vehicle arbitration programs, and government transportation regulators, to provide history reports for individual vehicles.³⁴ The reports are sold to the public and auto dealers on Internet-based platforms using the 17-character Vehicle Identification Number (VIN) of the vehicle. VHR providers tout their ability to

³³ Related, Schneider (2010) finds significantly less vehicle care among taxicabs operated by lessee-drivers compared to owner-drivers.

³⁴ For example, see CARFAX (2015) for sources.

identify items of material importance to buyers, including vehicle accident and repair histories, ownership records, and odometer tampering.

We are not aware of academic work on VHRs, but investigations by *Consumer Reports* and the Automobile Protection Association (APA) shed light on their accuracy.³⁵ In 2009, *Consumer Reports* published the results of a cleverly designed study that examined VHRs for vehicles advertised as wrecks on salvage-auction websites.³⁶ *Consumer Reports* found that many reports for these wrecked vehicles returned “clean” results, sometimes from all five VHR providers that they checked.

The APA study involved sending a mechanic trained in inspections to Canadian dealers and private sellers to flag cars with repaired collision damage that would have been invisible to a typical car buyer. APA gathered VHRs for these vehicles and discovered that the VHRs failed to identify the adverse historical events in ten to fifty percent of these cars, with the accuracy depending on the Canadian province and the VHR provider, likely due to the different data sources and reporting practices across provinces and providers. The conclusion we draw is that VHRs provide a valuable but incomplete service.³⁷

Leasing

³⁵ VHR providers have occasionally been criticized for providing incomplete information and overstating the accuracy of their services in advertisements. A class action against CARFAX in 2004 found that CARFAX provided incomplete information; CARFAX has improved its data collection and advertising practices somewhat in response.

³⁶ See *Consumer Reports* (2009).

³⁷ VHR providers somewhat acknowledge this incompleteness, but the APA argues that these disclosures are not made sufficiently clear to consumers. VHR providers include CARFAX, AutoCheck, and VINCheck in the U.S., and additionally CarProof and the Ministry of Transportation of Ontario Used Vehicle Information Package in Canada.

Vehicle leasing involves the use of a vehicle by a lessee for a pre-determined period of time, typically 24, 36, or 48 months, with a recent average of 36 months and rarely over 60 months.³⁸ A typical contract stipulates the lease term, an early termination fee, a maximum number of miles (usually between 10 000 and 15 000 miles per year), and an overage fee for exceeding this maximum (e.g., 15 cents per mile). The contract also specifies the down-payment and monthly-payment amounts, the price at which the lessee can buy the car at lease end (called a lease “buyback” or “buyout”), and maintenance and repair responsibilities. Typically, lessees must conduct maintenance according to manufacturer recommendations and repairs associated with accidents, vandalism, and misuse, while the manufacturer warranty covers mechanical failures.³⁹ Manufacturers sometimes also include maintenance warranties, more commonly for luxury cars, that cover the price of maintenance expenses over the first six months to four years.

Vehicle leasing in the U.S. rose from obscurity in the early 1980s to approximately one-third of new-car sales by the late 1990s. This rate decreased slightly in the 2000s but still remains above 25 percent. Lease rates in Europe followed a similar pattern, even continuing to rise slightly through the 2000s.⁴⁰ Leasing is less common in

³⁸ Data on lease terms are available from CNW Marketing Research and Edmunds (2011).

³⁹ Given the importance of the contractual terms for the incentives faced by lessees and lessors, here is an example of the exact language of a typical lease contract, from a 2010 Ford, “Proper vehicle maintenance is your responsibility. You must maintain and service the vehicle at your own expense, using materials that meet the manufacturer’s specifications. This includes the following the owner’s manual and maintenance schedule, documenting maintenance performed, and making all needed repairs ... You are responsible for repairs for all damages which are not a result of normal wear and tear ... If you have not had the repairs made before the vehicle is returned at the scheduled end of this lease, you will pay the estimated costs of such repairs.”

⁴⁰ European statistics on car leasing are available from Leaseurope at www.leaseurope.org (accessed January 1, 2015).

the used-car market. One reason may be moral hazard; used cars are more susceptible to damage from poor driver care and maintenance, which is hard to enforce in a leasing contract. As mentioned above, Johnson and Waldman (2010), Schneider (2010), and Johnson, Schneider, and Waldman (2014) suggested and provided evidence for this problem.

Given that adverse selection inhibits secondhand trade, Hendel and Lizzeri (2002) and Johnson and Waldman (2003, 2010) predicted that lessors, which in the U.S. are typically car dealers, can address this problem by setting lease buyback prices at levels that incentivize lessees to return their cars to dealers (and consequently to the secondhand market) at efficient levels upon lease expiration. In this way, leasing can reduce or eliminate adverse selection. Johnson, Schneider, and Waldman (2014) found strong evidence of this prediction. More broadly, Johnson, Schneider, and Waldman (2014) provided evidence that the increase in car reliability since the 1980s may have propelled the leasing boom. This is because better reliability made maintenance less essential and reduced the leasing moral hazard that was likely a main contributor to low lease rates.

In principle, buyer liquidity constraints could also explain the high lease rates for new cars in recent years, as leasing reduces monthly payments compared to financing, and lower payments may be more relevant for new rather than used cars due to their higher base price. However, Aizcorbe and Starr-McCluer (1997), Mannering, Winston, and Starkey (2002), and Johnson, Schneider, and Waldman (2014) found the highest lease rates among the highest-income households, suggesting that affordability is not the primary factor for many or most buyers. The popularity of leasing has also been

attributed to its ability to reduce transaction costs – notably, the costs associated with returning a car at lease expiration are less than the costs of selling the car on the secondhand market – and there is evidence for this as well (Gavazza 2011, Schiraldi 2011, and Johnson, Schneider, and Waldman 2014).^{41,42}

Certified Pre-Owned

Used-car certification programs began in earnest in the 1990s and have come to comprise a significant fraction of used-car sales at dealers. Certification programs typically entail a detailed inspection and refurbishing by the dealer, or a selection of cars already in excellent condition, and a complete warranty from the manufacturer for one or two years that is similar to or the same as the new-car warranty. Certification programs typically involve late-vintage used cars and represent a viable alternative for shoppers who are considering a new car. According to data from CNW Marketing Research, the number of certified used-car sales in the U.S. increased from 452,829 in 1997 to 1,940,250 by 2005, with luxury and near-luxury makes comprising about one-third of sales.

One can consider the warranty as a key component of the certification program in the sense that sellers take responsibility for the cost of hidden defects that may appear in the year or years after sale. This has the potential to assuage buyer concerns about

⁴¹ In other markets, the motivation for leasing may be tax advantages or a manufacturer time-inconsistency problem. But these factors are unlikely to be important for the car market. See Johnson, Schneider, and Waldman (2014) for a discussion.

⁴² Leasing, however, may impose costs that are not present for owning. For example, standard lease contracts include charges for exceeding maximum mileage limits, charges for returning a vehicle prior to lease expiration, a required minimum level of insurance that can exceed the level a consumer would buy if he or she purchased the same car, and an inability to refinance to a lower interest rate which is typically allowed with car loans.

adverse selection. We are not aware of academic work on certification programs and adverse selection, but data from CNW Marketing Research indicate that certified cars require up to 11 percent fewer repairs after purchase compared to their non-certified counterparts that traded through dealers. These data also indicate that certified used cars cost 3 to 7 percent more than non-certified cars.

Warranties

Warranties originate from the manufacturer, a dealership, or an aftermarket entity. Manufacturer warranties are included with the purchase of virtually all new cars and have been for many decades, and, as mentioned above, are typically included with certified used cars. Manufacturer warranties typically transfer with ownership and cover the repair of most mechanical problems that are not directly due to driver events such as accidents and vehicle misuse. Most manufacturer warranties have a “bumper-to-bumper” component, and a longer-term “powertrain” component covering major engine and transmission failures.⁴³

Warranties for used cars are typically dealership warranties, which are usually valid only with the dealership that sold the contract, and aftermarket warranties, which are underwritten by a third party and are sold either by a dealer or, rarely, independently. These non-manufacturer used-car warranties may be less secure than manufacturer warranties in the sense that the aftermarket party and, to an extent, the dealer could go out of business, leaving the warranty holders empty handed because they are subject to a

⁴³ For example, the manufacturer warranty for a 2010 Ford can be found at Ford (2010), and includes a three-year or 36 000-mile (whichever comes first) bumper-to-bumper warranty and a five-year or 60 000-mile powertrain warranty. Tires and vehicle-body corrosion are also typically covered under manufacturer warranty with varying stipulations.

patchwork of different state requirements for re-insurance and solvency. Non-manufacturer warranties also sometimes subject owners to the transaction costs and annoyances and uncertainties of paying for the repair upfront and then submitting for a reimbursement.

Manufacturer-warrantied repairs must be conducted at an authorized dealer, while aftermarket warranties must be conducted at a facility designated by the warranty company. However, car warranties in general do not require that *non-warrantied* maintenance and repairs be conducted at any particular repair facility to keep the warranty in good standing. This stipulation is due to federal legislation from 1975 called the Magnuson-Moss Warranty Act that required warranties to be written in plain English, gave more enforcement authority to the Federal Trade Commission, and obligated underwriters to honor warranties even if the car owner him or herself conducted prior maintenance or if aftermarket or recycled parts were previously used.⁴⁴

We highlight two aspects of warranties in the context of information problems. First, the “free” nature of repairs under warranty may lead car owners to conduct too many repairs from an efficiency perspective, and for car owners to provide too little care for the vehicle. On the other hand, warranties may have the ability to reduce adverse selection. The reason is that hidden defects should be less concerning to buyers of cars under warranty, as the costs of these repairs are covered by warranty. With this concern removed, buyers need not discount their willingness to pay (by as much, at least) to

⁴⁴ The warranty writer may deny warranty coverage if the warranty writer can demonstrate that previous maintenance or repairs or parts caused the current defects. For more on warranties and the Magnuson-Moss Warranty act, see Federal Trade Commission (2015a, 2015b).

account for possibility of hidden defects, which in turn allows high-quality car owners to obtain the full-information price for their cars (or close to it).⁴⁵

The potential for warranties to increase moral hazard (generating too many repairs) and reduce adverse selection (facilitating secondhand trade) suggests that, from an information perspective, an optimal warranty is one that provides relatively more coverage for car parts with asymmetric information and relatively less for parts that are symmetrically observed. Early related work on warranties and asymmetric information includes Lutz (1989) and Dybvig and Lutz (1993), but we are not aware of analysis that incorporates the reality that goods have multiple parts with heterogeneous properties, including heterogeneous information properties, and that optimal warranty design may depend on this.

Lemon Laws

Lemon laws are an informal name for federal and state laws requiring manufacturers to guarantee a minimum level of product quality. As mentioned above, the Magnuson-Moss Warranty Act stipulates a set of conditions required of implicit and explicit manufacturer warranties. All U.S. states have adopted additional lemon laws since the 1980s, which typically require manufacturers to replace or repurchase a

⁴⁵ This presumes that the “lemon-ness” is a characteristic that is transitory and can be fixed. In principle, lemon-ness can be permanent (e.g., recurring problems due to poor manufacturing craftsmanship). As Pratt and Hoffer (1984) and Bond (1984) noted, Akerlof (1970) allowed for both types. There are reasons to think any lemon-ness today is transitory. First, advancements in car production since the 1970s have greatly increased the consistency of manufacturing and assembly, such that the nature of car reliability has shifted away from individual cars within a model-vintage having idiosyncratic structural problems, and towards everyday wear and tear from driver use (Womack, Jones, and Roos 1990). Second, lemon laws may remove many cars that would be described as having permanent lemon-ness from the population. Third, Engers, Hartmann, and Stern (2009) report the correlation in ownership durations across owners of a car over time; a positive correlation would indicate that lemon-ness is permanent and generating recurrent trade – but they find a negative correlation.

defective new car if several attempts to fix a material defect are unsuccessful. For example, in New York State, the period is the earlier of two years or 18 000 miles. Most states also require manufacturers to identify to buyers that a car was repurchased under lemon laws. We are not aware of any formal economic analysis of lemon laws as they relate to the car industry.

Reputation

The theoretical literature on reputation and repeat-business mechanisms dates back to seminal papers by Klein and Leffler (1981), Shapiro (1983), Kreps and Wilson (1982), Milgrom and Roberts (1982) and Kreps, Milgrom, Roberts, and Wilson (1982). Reputational concerns may incentivize sellers to address quality problems or disclose hidden defects to buyers before sale. We are not aware of empirical work that has explicitly tested for reputation effects in the car market, but Peterson and Schneider (2014a) found that, controlling for car characteristics, used cars purchased from dealers require fewer repairs than cars purchased from private individuals. This is consistent with an important role for reputation, as dealers clearly have stronger reputational incentives than private individuals.

6. DATA AND OTHER RESOURCES

In this section, we note some of the main data sets that are available to researchers interested in the car market. We focus on data sets that are publicly available, with or without a fee.

- Consumer Expenditure Survey. Since 1980, the survey has been a rolling-panel data set with households that enter and exit every five quarters. Among the very detailed household expenditure data, the survey asks about car stocks, including detailed questions on individual cars and car-related expenditures, detailed acquisition and disposal information, and detailed payment information. The survey files that are most relevant for cars and car expenditures are the LSD, OVB, OVC, VEQ, and VOT parts of the Detailed Expenditure files.
- Ward's Automotive. This publication provides aggregated and disaggregated data on the automobile industry, including data on total production and sales by model and plant, country production figures, automobile equipment specifics, exports and imports, and vehicle specifications. They also conduct a dealer survey.
- Automotive News. This publication provides information that is similar to Ward's Automotive, as well as a comprehensive database on consumer and dealer incentives.
- Consumer Reports. This publication reports data from an annual survey sent to several million subscribers of *Consumer Reports* magazine per year concerning their experiences with their cars, which receive responses for many hundreds of thousand vehicles (varying by year) recorded by model, vintage, and age for cars up to age eight. Respondents are asked to identify problems they "considered serious on account of cost, failure, compromised safety, or downtime" during the past 12 months in over a dozen categories. Respondents are asked to include problems covered by warranty, but not problems resulting from accident damage. Through 2004,

Consumer Reports reported defect rates for a model-vintage-age and part as being in one of five specified probability ranges.^{46,47}

- Edmunds.com. This website provides detailed information about current and past car models, including information on vintages in which major model refreshes occurred and general consumer tips.
- R.L. Polk & Co. This provider makes available data on the automobile market, including historical and current data on cash sales, leasing, and financing by car make and model, and is the parent of CARFAX. As of 2013, R.L. Polk & Co. is owned by the firm IHS.
- National Automobile Dealers Association. This group makes available a range of data and reports about the car market, with a focus on dealerships, providing information such as dealership profits, inventory levels, employee payroll information, advertising expenditures, and so on, usually aggregated to the state and national level.

Nominally available to the public but practically more difficult to obtain are new- and used-car registration and driver driving outcome data from the Departments of Motor Vehicles of individual states. These data have been used with success by Engers, Hartmann, and Stern (2009), Schneider (2010), Hoekstra, Puller, and West (2014), Murry

⁴⁶ The survey response rate is relatively low, but response bias does not appear to be a problem. Peterson and Schneider (2014) provide more information on this issue and these data in their Online Appendix.

⁴⁷ On the topic of *Consumer Reports*, it is interesting to note that, according to data from CNW Marketing Research, nearly one-quarter of all used-car buyers, and over 40 percent of late-vintage used-car buyers, consult *Consumer Reports* magazine in their shopping process (though this rate has slipped slightly in recent years).

and Zhou (2014), and Murry (2015).⁴⁸ Freedom of Information Act laws may be used to request these data, though in our experience a productive outcome is not assured, as the government agency may not respond expediently or at all to a request.

Additionally, it is not uncommon for studies to use researcher-collected data sets or proprietary data sets from automobile-industry firms (e.g., Autobyte, Inc., J.D. Power and Associates). Examples of papers using these types of data are Scott Morton, Zettelmeyer, and Silva-Risso (2003) and Alcott (2013). Lastly, many automobile dealerships now list their new- and used-car inventory on their website or on a website such as Edmunds.com. Data have been scraped from these websites for research (e.g., Olivares and Cachon 2009).

7. CONCLUSION

In this chapter, we have reviewed the institutions, economic literature, and data and resources available for the car market. The car market has received outsized attention among researchers for good reason: It is an enormous market, important in its own right, but also showcases a range of important economic principles, from adverse selection and moral hazard to double marginalization and location agglomeration. It represents a market that nearly all researchers and consumers of research are familiar with, and for which abundant data are available. We expect social scientists will continue to turn to the car market for important theoretical and empirical guidance.

⁴⁸ Related, the State of Massachusetts has made available a large data set on automobiles, household characteristics, and spatial data for a crowd-sourced data project. These data can be found at www.37billionmilechallenge.org (accessed February 1, 2015).

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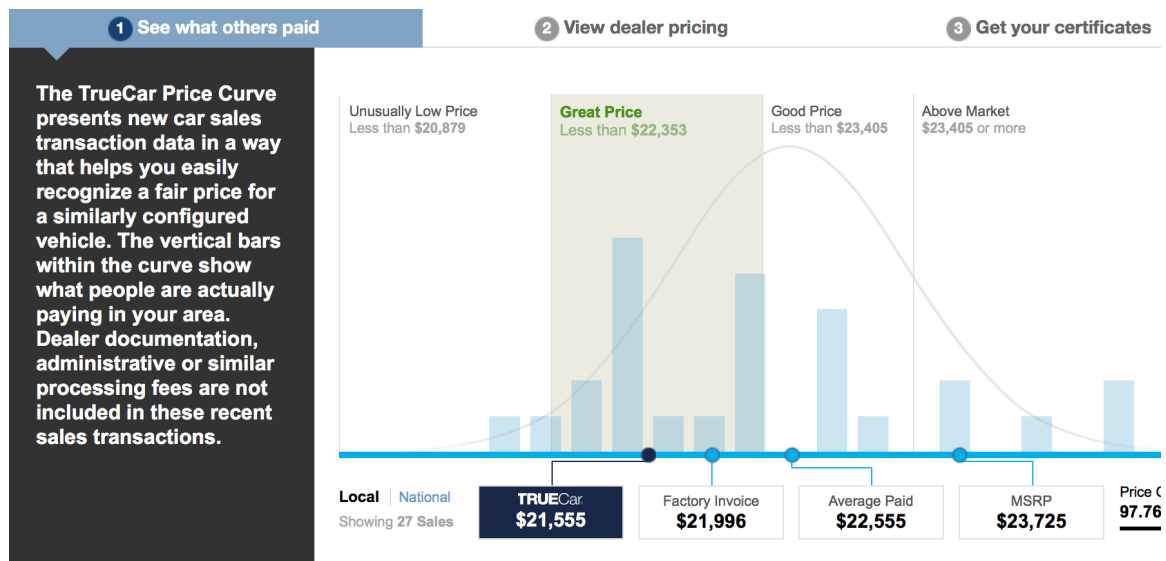
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Figure 1: Prices of LX CVT trim of new 2015 Honda Accord Sedan in local market



Notes: The figure is a website screen shot from www.truecar.com showing transaction prices in the Albany, New York area for a new 2015 Honda Accord Sedan with the LX CVT trim, 4-cylinders, automatic transmission, in silver with a black-cloth interior as of February 7, 2015.